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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/352,194    07/13/99    YAMAZAKI    S    0756-1998

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MMC1/0423

EXAMINER

TOLEDO, F

ART UNIT	PAPER NUMBER
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2823

DATE MAILED:

04/23/01

**Please find below and/or attached an Office communication concerning this application or proceeding.**

**Commissioner of Patents and Trademarks**

<b>Office Action Summary</b>	Application No. 09/352,194	Applicant(s) YAMAZAKI ET AL.	
	Examiner Fernando Toledo	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 31 January 2001.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 5-35 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 5-35 is/are rejected.
- 7) ☒ Claim(s) 12 and 19 is/are objected to.
- 8) ☐ Claims \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.
- 11) ☒ The proposed drawing correction filed on 31 January 2001 is: a) ☒ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

### Attachment(s)

- |  |  |
|--|--|
| 15) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 18) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 16) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                  | 19) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 17) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>11, 13, 16</u> . | 20) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

1. Claims 5, 6, 8 – 10, 12, 14 – 17, 19 – 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takemura (U. S. patent 5,616,506) in view of Zhang et al. (U. S. patent 5,569,610).

In re claims 5, 6, 8, 12, 15, 19, 21 and 22, Takemura in the U. S. patent 5,616,506; figures 1A – 7E and related text discloses adding a catalytic element (e.g. nickel film 105) for facilitating crystallization on an amorphous semiconductor thin film (column 6); carrying out a first heat treatment to transform the amorphous semiconductor into a crystalline semiconductor (column 6); carrying out a second heat treatment in a reducing atmosphere that contains hydrogen (column 7). The term reducing atmosphere is interpreted as requiring some atmosphere that contains a reducing agent, such as HCL. See In re Zletz, 13 USPQ2d 1320 (Fed. Cir. 1989)(Claims are given their broadest possible interpretation during PTO prosecution). It is noted the specification does not set forth an explicit definition for what Applicant regards as a reducing atmosphere.

In re claims 5, 9, 12 and 16, Takemura teaches that the second heat treatment is carried out in a temperature range from 900°C – 1200°C (column 7).

In re claims 6, 10, 14 and 17, Takemura teaches that the second heat treatment is performed in a closed compartment, which is a furnace (column 7).

In re claim 8 and 12, Takemura discloses including a halogen element (column 7).

In re claims 12, 19 – 22, Takemura teaches patterning the crystalline semiconductor thin film into at least one crystalline semiconductor island to form at least a channel region formation region (column 7).

Takemura does not disclose using an ultraviolet (UV) or infrared (IR) light to carry out the first heat treatment.

However, Zhang in the U. S. patent 5,569,610 (hereinafter Zhang 610); figures 1A – 5E and related text show carrying out a first heat treatment of an amorphous silicon film to form a thin film transistor with an excimer laser having a light with a wavelength of 248nm to crystallize the amorphous silicon (column 5).

Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a laser as taught by Zhang 610 to crystallize the amorphous silicon of Takemura since Zhang 610 will enable the practitioners of Takemura to heat treat the amorphous silicon film with a laser irradiating UV light.

In re claims 19 – 22, Takemura teaches selectively providing the crystalline semiconductor thin film with an element of group VA (e.g. phosphorous) with the nickel still in the thin film (column 7); Takemura heats the semiconductor after doping it, therefore the nickel will be gettered (column 7).

2. Claims 7, 11, 13 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takemura in view of Zhang 610 as applied to claims 5, 6, 8 – 10, 12, 14 – 17, 19 – 22 above, and further in view of Zhang et al. (U. S. patent 5,888,857).

In re claims 7, 11 and 13, Takemura lacks anticipation on the annealing performed in an atmosphere void of oxygen or oxides.

However, Zhang in U. S. patent 5,888,857 (hereinafter Zhang 857); figures 1A – 11D and related text, teaches that the annealing process can be done in an environment void of oxygen. This is done to prevent the silicon from reacting with oxygen thereby preventing the formation of silicon oxide film, which prevents crystallization of the amorphous silicon film (columns 7 and 8).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to anneal the silicon wafer as in Takemura in an environment void of oxygen as taught by Zhang 857 to promote further the crystalline growth of amorphous silicon.

3. Claim 23 rejected under 35 U.S.C. 103(a) as being unpatentable over Takemura in view of Zhang 610, Zhang 857 and Dorin et al.

Takemura teaches adding a catalytic element facilitating crystallization growth of an amorphous semiconductor film (column 6). Takemura also teaches the heat treatments, the introduction of phosphorous in a source and drain region, carrying out a second heat treatment in a temperature range of 900 – 1200°C (columns 6 and 7).

Takemura does not disclose using an ultraviolet (UV) or infrared (IR) light to carry out the first heat treatment.

However, Zhang 610 shows carrying out a first heat treatment of an amorphous silicon film to form a thin film transistor with an excimer laser having a light with a wavelength of 248nm to crystallize the amorphous silicon (column 5).

Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use a laser as taught by Zhang 610 to crystallize the amorphous silicon of Takemura since Zhang 610 will enable the practitioners of Takemura to heat treat the amorphous silicon film with a laser irradiating UV light.

However Takemura in view of Zhang 610 does not show an ammonia atmosphere during the annealing process of the second heat treatment.

Zhang 857 discloses that the annealing for crystallization can be done in an atmosphere of hydrogen and nitrogen without oxygen.

However Takemura in view of Zhang 610 and further view of Zhang 857 does not show ammonia in the atmosphere.

However, it is very well known in the art, as taught by Dorin et al. in page 532, that an atmosphere containing nitrogen and hydrogen at high temperatures will produce ammonia.

Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use Zhang 857 process with Takemura in view of Zhang 610 to anneal a semiconductor film in an atmosphere void of oxygen and use hydrogen and nitrogen as in Zhang 857 which forms ammonia at high temperatures, since it further the crystallization growth of the amorphous silicon film of Takemura in view of Zhang 610. It would also have been obvious to one having ordinary skill in the art at the time the invention was made to use ammonia, as the annealing environment on the second annealing of Takemura in view of Zhang 610 as taught by Zhang 857, since it has been held to be within the general skill of the worker in the art to select a known

material on the basis of its suitability for its intended use involves ordinary skill in the art  
In re Leshin, 125 USPQ 416.

4. Claims 24 – 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takemura, Zhang 857, Zhang 610 and Dorin as applied to claims 5 - 23 above, and further in view of Sameshima et al. (U. S. patent 5,910,015).

In re claims 24 – 31 Takemura in view of Zhang 857, Zhang 610 and Dorin does not show wherein the thin film comprises  $\text{Si}_x\text{Ge}_{(1-x)}$  ( $0 < x < 1$ ).

However, Sameshima in the U. S. patent 5,910,015; figures 1 – 5 and related text, shows that increasing the grain size of the crystalline silicon (i.e. by adding Ge to the silicon thin film) it increases the carrier mobility and therefore circuits with switching speeds higher than 10MHz can be manufactured using a crystalline silicon thin film transistor (column 1).

Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to add Ge to the silicon thin film (to form SiGe thin films) in order to increase the grain size of the crystalline silicon and therefore increase the carrier mobility of the semiconductor thin film transistor.

5. Claims 32 – 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takemura and Zhang 610 as applied to claims 19 and 21 above, and further in view of Yamazaki et al. (U. S. patent 6,093,937).

In re claims 32 and 33, Takemura in view of Zhang 610 does not disclose that the semiconductor device is an active matrix EL display device.

However, Yamazaki in the U. S. patent 6,093,937; figures 1A – 20F and related text shows that a TFT semiconductor device can be an EL display device (column 27).

Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the invention of Takemura in view of Zhang 610 as disclosed by Yamazaki since using the invention as disclosed by Yamazaki will realize the function of the device which is to be used in devices that use the thin film transistor technology.

In re claims 33 and 34, Takemura in view of Zhang 610 does not disclose wherein the semiconductor device is one selected from the group including of a video camera, a digital camera, a projector, a goggle-type display, a car navigation system and a personal computer.

However, Yamazaki in figures 20A – 20F shows the places where a TFT can be used (column 27).

Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the invention of Takemura in view of Zhang 610 as disclosed by Yamazaki since using the invention as disclosed by Yamazaki will realize the function of the device which is to be used in devices that use the thin film transistor technology.

### ***Response to Arguments***

6. Applicant's arguments with respect to claims 5 – 23 have been considered but are moot in view of the new ground(s) of rejection.



**Conclusion**

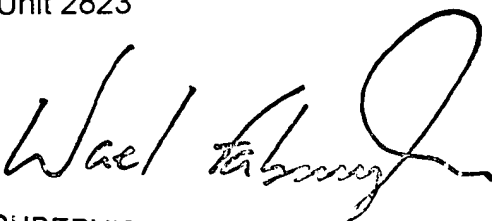
7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fernando Toledo whose telephone number is (703) 305-0567. The examiner can normally be reached on Monday – Friday, 8am – 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Fernando Toledo  
Patent Examiner  
Art Unit 2823

ft  
April 16, 2001

  
SUPERVISORY PRIMARY EXAMINER  
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